AbstractID: 11222 Title: Feasibility study of helical tomotherapy for dose painting

Purpose: Important limitations for dose painting are due to treatment planning and delivery constraints. The purpose of this study was to determine the sensitivity of dose conformity to optimization parameters using the clinical TomoTherapy Hi-Art treatment planning system (TPS).

Materials and Methods: Uptake data from a patient who underwent a [^{61}Cu]Cu-ATSM PET/CT (surrogate of hypoxia) scan was retrospectively extracted for treatment planning. Extracted data was reformatted from voxel-based to level-based for compatibility with the Hi-Art TPS. Optimized treatment plans were generated with physical objectives for each prescription sub-volume modifying pitch, jaw width, modulation factor and iteration number. Effects of variations in plan parameters were simulated varying one physical parameter while keeping the other parameters unchanged. Avoidance structures were not used. The conformity of treatment plans to their non-uniform prescriptions was evaluated via quality-volume histograms (QVH) and percent receiving planned dose within 2 percent of prescription ($Q_{0.98\text{-}1.02}$).

Results: In general, the conformity of treatment plans to dose prescriptions was found to be adequate for delivery of dose painting plans. The conformity was better as the jaws decreased in width from 2.5 cm to 1.0 cm ($Q_{0.98\text{-}1.02}$:64% vs 73%) and as the pitch increased from 0.122 to 0.443 ($Q_{0.98\text{-}1.02}$:71% vs 73%). The effects on dose conformity of modulation factor and iteration number seem to be insensitive to change. Treatment delivery times varied from 5-11 minutes for changes in field width (2.5 cm to 1.0 cm) and from 11-25 minutes for changes in pitch (0.443 to 0.122).

Conclusions: This investigation demonstrates the ability of the helical tomotherapy to create and deliver plans with non-uniform dose distributions. Results indicate that agreement in prescription dose and planned dose distributions for all treatment plans are sensitive to physical parameter changes such as pitch and field width but insensitive to changes in modulation factor and iteration number.